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Comparison of HMDS and HMDSO precursors for PECVD hydrophobic Si-C-H coatings

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In order to optimize the hydrophobicity of Si-C-H coatings prepared by plasma enhanced chemical vapour deposition (PECVD), the effect of using either hexamethyldisilazane (HMDS) or hexamethyldisiloxane (HMDSO) as the Si-C precursor on the film properties was compared. Eight coating runs were performed in different precursor gas mixtures, each containing also methane or acetylene in high or low concentration, and hydrogen. The coatings were prepared in a vacuum chamber at 1.2 Pa with 100 W plasma power and 320 V d.c. bias at ambient temperature. Silicon, quartz and glass substrates were coated simultaneously. Furthermore, the effect of a post-deposition heat-treatment in nitrogen (2 h at 573 K) was investigated. The coatings were characterized by UV-VIS and Raman spectroscopy, spectroscopic ellipsometry, optical microscopy and contact angle. Static sessile drop contact angles of three different probe liquids (formamide, water, diiodomethane) were evaluated by microscopic image analysis for characterization of wetting behaviour and hydrophobicity. Deposition rates were characterized by gravimetry and via ellipsometric thickness. It was found that in each case HMDSO led to slightly more hydrophobic samples than HMDS. The influence of the other preparation parameters on film properties and wetting behaviour was also discussed.

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Keywords

PECVD

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HMDSO

contact angle

ellipsometry